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## Exchange rate contagion in Latin America<sup>☆</sup>



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### ABSTRACT

A regular vine copula approach is implemented for testing for contagion among the exchange rates of the six largest Latin American countries. Using daily data from June 2005 through April 2012, we find evidence of contagion among the Brazilian, Chilean, Colombian and Mexican exchange rates. However, there are interesting differences in contagion during periods of large exchange rate depreciation and appreciation. Our results have important implications for the response of Latin American countries to currency crises originated abroad.

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## 1. Introduction

Empirical studies on exchange rates have focused on testing the efficient markets' hypothesis. Relatively little attention has been given to assessing exchange rate co-movements. However, as shown in some recent literature,<sup>1</sup> exchange rates dependence is a relevant topic. It is crucial for the risk hedging

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<sup>1</sup> See Kang et al. (2002), Chadwick et al. (2012), Patton (2006), Fernández (2007), Kuhl (2008), Orlov (2009), Benediktsdottir and Scotti (2009), and Kitamura (2010).

decisions of investors taking positions in international financial markets, and also for economic policy assessment and international economic policy coordination.

The recent international financial turmoil, which began in the United States subprime mortgage market and rapidly spread all over the world, highlights the relevance of studying financial linkages and contagion among international financial markets. Different definitions of contagion co-exist in the literature.<sup>2</sup> In this study we follow the definition of [Forbes and Rigobon \(2002\)](#). They define contagion as a significant increase in cross-market linkages after the occurrence of a shock in one country. They show that the mechanism of transmission of crises arises from high interdependence among markets. Defining contagion this way allows distinguishing between temporal and permanent mechanisms for the transmission of crises. This differentiation is crucial for designing economic policy actions that may be useful for preventing or diminishing the negative effects caused by external shocks.

Particularly, whenever contagion is identified between any two pairs of exchange rates, short-run isolation policies such as capital controls or central bank interventions in foreign currency markets may be effective for isolating a country from a currency crisis originated abroad. However, whenever the transmission of crises is due to permanent channels (no contagion) these policies may be ineffective and costly. Capital controls, for example, may delay the effects of an external crisis in a particular country, but will not be able to permanently avoid such effects.

The aim of this paper is to disentangle the level of contagion in Latin American exchange rate markets using a methodology that goes beyond a simple analysis of correlation breakdowns. We use daily data on exchange rates for the six largest Latin American countries<sup>3</sup> from June 2005 through April 2012. Under our approach, contagion is defined as a situation in which significantly different values of dependence coefficients are encountered during times of crises and during normal times. As in [Bradley and Taqqu \(2004\)](#) and [Durante and Jaworski \(2010\)](#) we measure middle and tail dependencies using local correlation coefficients. We implement a regular vine copula approach for modeling the multivariate dependence among exchange rates. The regular vine structure is computed following the methodology proposed by [Dissmann et al. \(2012\)](#).

Pair-copula construction, initially proposed in the seminal work of [Joe \(1996\)](#) and extended by [Bedford and Cooke \(2001, 2002\)](#), is a method that allows computing a  $d$ -variate distribution as the product of  $d(d-1)/1$  bivariate copulas. Various studies have implemented C-vine and D-vine pair-copulas.<sup>4</sup> However, these methods are particular cases of regular vines. In this sense, our approach is more comprehensive than those frequently used in the literature.

Studying the dependence among Latin American countries exchange rates is crucial both for local policy makers and for investors worldwide. From the standpoint of local policymakers, the nominal exchange rate is a key macroeconomic variable in a small open economy. For instance, it is a very important determinant of the price level. This importance is greater for small open economies with an inflationary past, like many Latin American countries.

From the point of view of global investors, the international financial crisis of 2007–2009 revealed the need to study in detail the performance of emerging markets, as these have become an important destiny for investments. Several Latin American countries, such as Colombia and Peru have recently acquired investment grades from the three major rating agencies, and hence investors around the world are interested in learning more about the economic conditions in these countries for making investment decisions. A key issue for investment decisions in Latin America deals with the interdependence between local markets.

Our results indicate that contagion exists among the Brazilian, Chilean, Colombian and Mexican exchange rates. For the cases of Argentina and Peru, the evidence exchange rate contagion with other countries in the region is much weaker. This result is consistent with interesting peculiarities of these two countries. Argentina's exchange rate behavior is quite independent from the behavior of other economies in the region given particular issues relating with the recent

<sup>2</sup> See, for instance, [Loaiza et al. \(2014\)](#), and [Kenourgios et al. \(2015\)](#).

<sup>3</sup> Argentina, Brazil, Chile, Colombia, Mexico and Peru.

<sup>4</sup> Example given, [Kurowicka and Cooke \(2006\)](#) and [Aas et al. \(2009\)](#).

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